Site Evaluation for Stormwater Infiltration

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Purpose of Site Selection Standard

- Characterize the Site
- Screen for Exclusions and Exemptions Under NR 151 Wis. Adm. Code.
- Establish Requirements for Siting an Infiltration Device.
- Selection of Design Infiltration Rates.
- Define Requirements for Site Evaluation Report.

Steps for Site Evaluation

- Step A – Initial Screening
- Step B – Field Verification of Information Collected in Step A.
- Step C – Evaluation of Specific Infiltration Area.
- Step D – Soil and Site Evaluation Reporting.

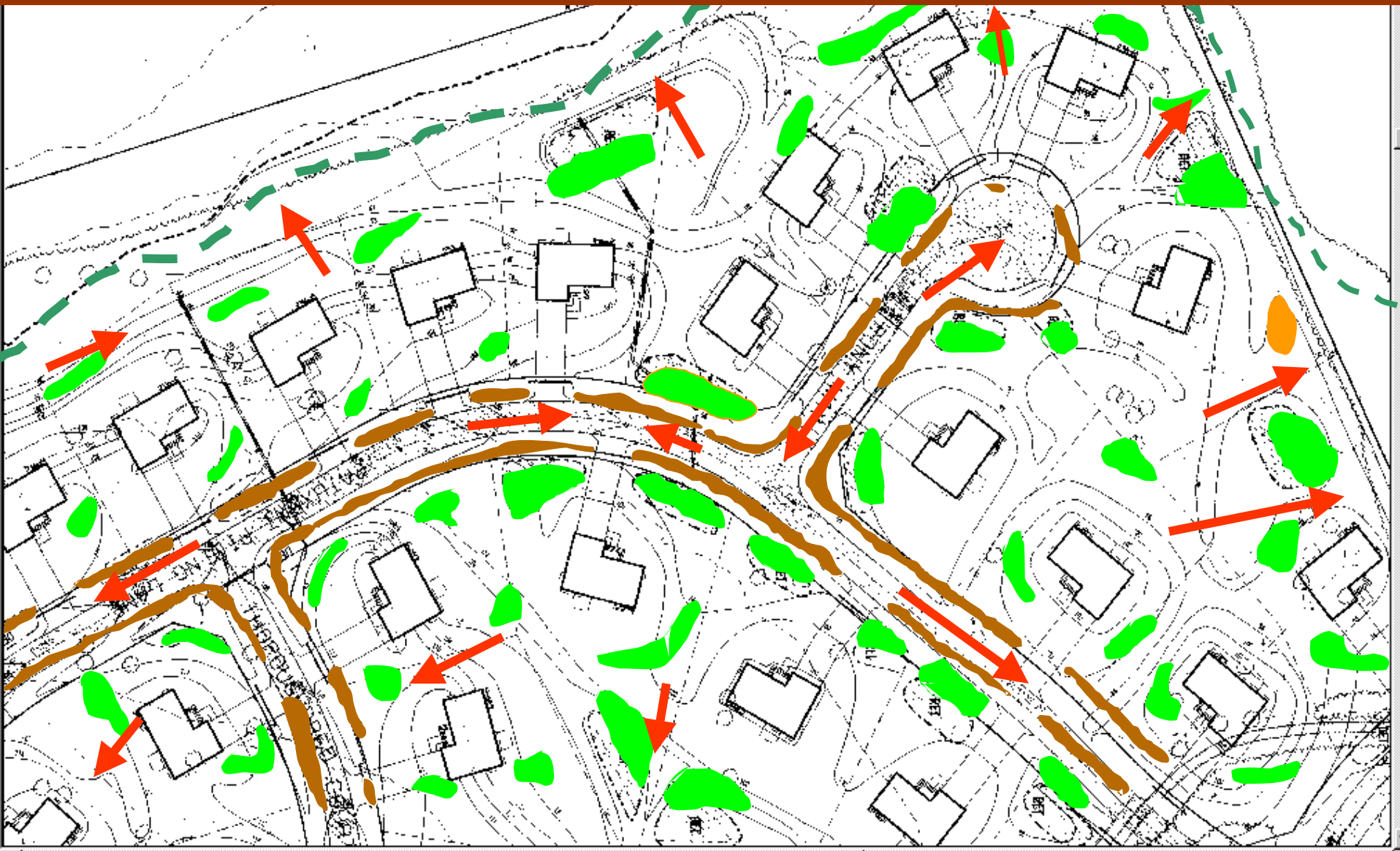

Steps A and B completed before final approval. Step C completed for public land and regional devices, but after approval for individual lots.

Step C Completed after Final Plat Approval If Final Location of Device Not Known – To Give Credit Plat Has Approx. Sizing.

Step A – Initial Screening

- Identify Potential Locations for Infiltration Devices.
- Determine if Installation is Limited by NR 151.
- Determine Where Field Work is Needed for Step B.

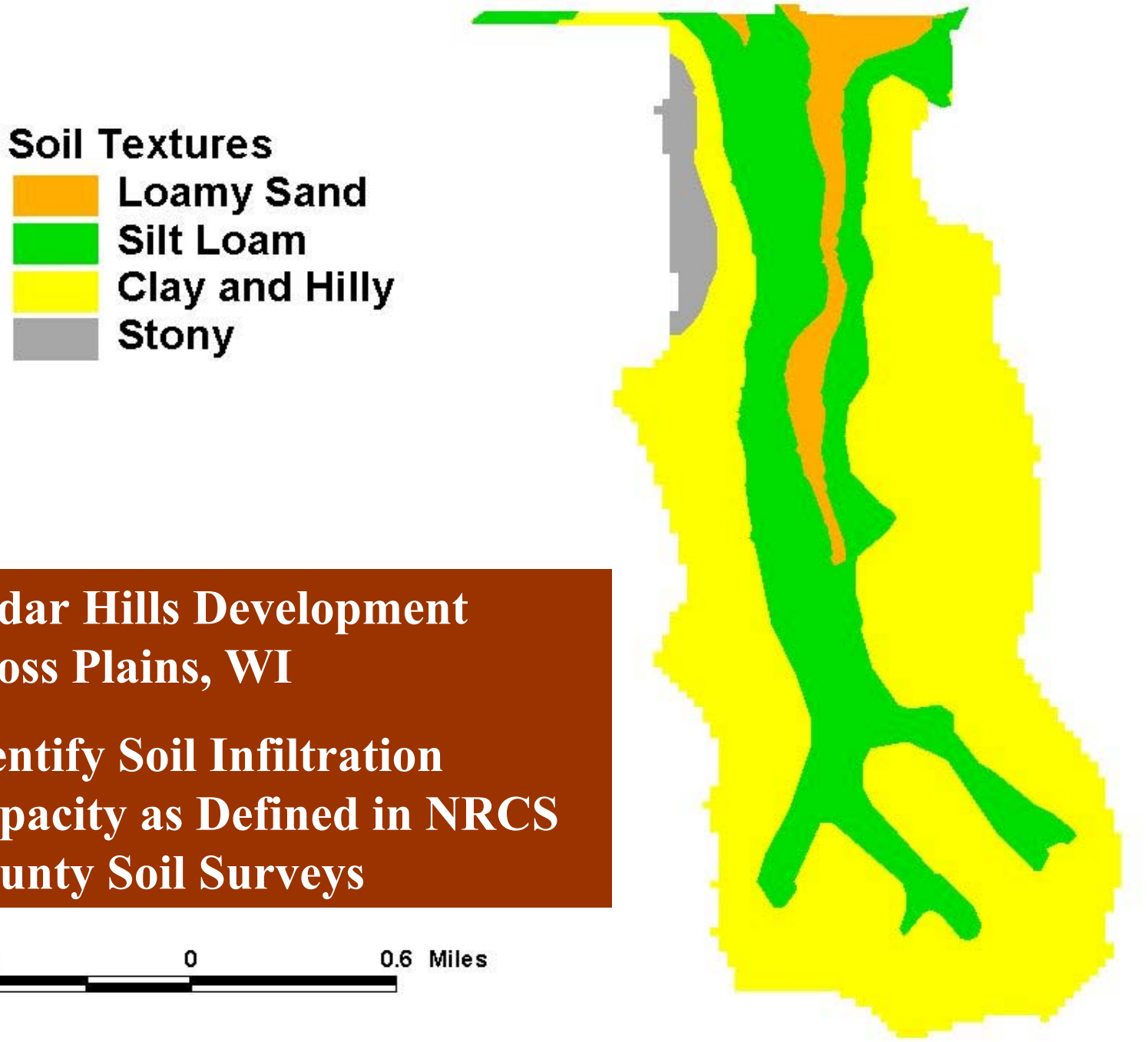
Explore Potential for Multiple Infiltration Areas Versus Regional



Things to Determine in Step A

- Site Topography and Slopes Greater Than 20%
- Infiltration Capacity
- Regional or Local Depth to Groundwater
- Presence of Hydric Soils
- Presence of Endangered Species
- Sites Where Infiltration is Excluded
- Sites Where Infiltration is Exempted


Cedar Hills Development –
Cross Plains, WI



Cedar Hills Development
Cross Plains, WI

Identify Soil Infiltration Capacity as Defined in NRCS County Soil Surveys


Cedar Hill Site Design,
Crossplains WI
Explanation
Wetpond
Infiltrations Basin
Swales
Sidewalk
Driveway
Houses
Lawns
Roadway
Woodlot
N
500 0 500 1000 Feet

Infiltration Basin – Cross Plains, WI


Cross Plains, WI


Pretreatment Detention
Pond – Cross Plains, WI

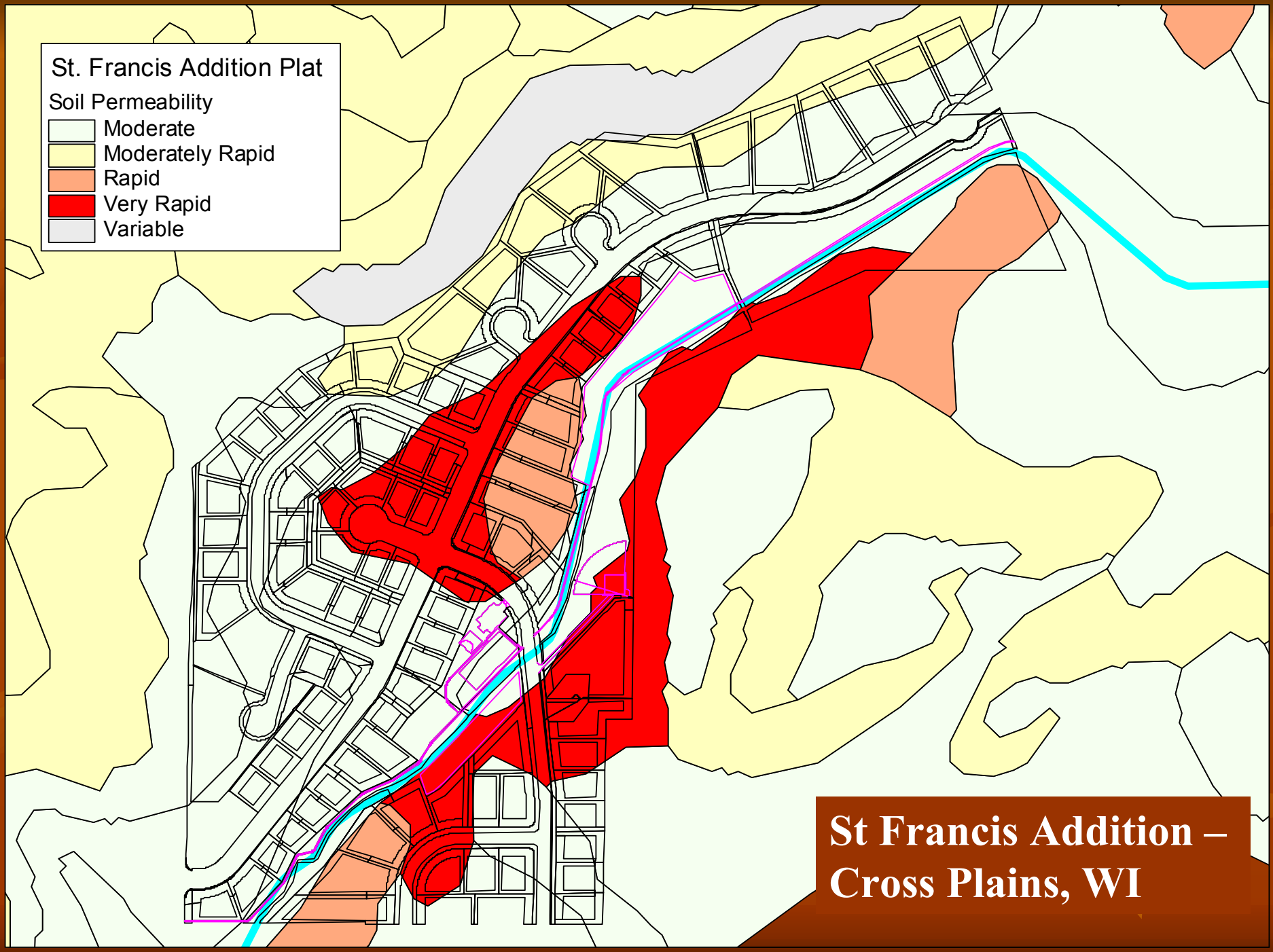

Infiltration Basin –
Cross Plains, WI

Sources of Information for Step A

- NRCS Soil Surveys.
- National Heritage Inventory Maps – Endangered Species.
- USGS, NRCS DNR, DATCP, DOT – Groundwater and Bedrock.
- http://dnr.wi.gov/org/water/dwg/ - Groundwater

Step B – Field Verification

- Field Verification of Seven Steps in Step A. For Example, Topography, Depth to Groundwater, Infiltration Characteristics, and Hydric Soils.
- Test for Percent Fines to Qualify for Any Exemption and Exclusion from Step A – Coarse Sand Only Texture Not Meet NR151.
- Borings and Pits used to Verify Infiltration Capacity and Depth to Groundwater and Bedrock.


St. Francis Addition Plat
Soil Permeability
Moderate
Moderately Rapid
Rapid
Very Rapid
Variable
St Francis Addition –
Cross Plains, WI

Site Design for St. Francis Additions

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Information to Record

- Dates Data was Collected.
- A Legible Site Plan/Map: *Planned filling, slopes, flood plain, pit locations, wetlands.*
- Soil Profile Information in Accordance with Field Book for Describing and Sampling Soils – USDA, NRCS,1998.

Soil Profile Information for Step B

- Thickness
- Munsell Soil Color Notation
- Soil Mottle or Redoximorphic Feature Color, Abundance, Size and Contrast.
- USDA Soil Textural Class
- Soil Structure, Grade, Size and Shape
- Occurrence of Saturated Soil, Groundwater,Bedrock, or Disturbed Soil.

Step C – Evaluation of Specific Infiltration Areas.

- Determine if Locations Identified are Suitable.
- Provide Information Needed for Design Work: *Site plan/map and soil profile descriptions*.
- A minimum Number of Pits or Borings Required.

Number of Pits and Borings – Step C

Infiltration Device	*Tests Required*	*Minimum Number of Pits or Borings*	*Minimum Drill/Test Depth*
Bioretention	Pits or Borings; Mounding	1 test/50 linear feet of device with a Minimum of 2	5 Feet or Depth to Limiting Layer
Infiltration Basin	Pits or Borings; Mounding	2 Pits per Area; With 1 Pit or Boring for Every 10,000 sq. ft.	Pits to 10 Ft. or Borings to 20 Ft.

Infiltration Basin - Monona, WI

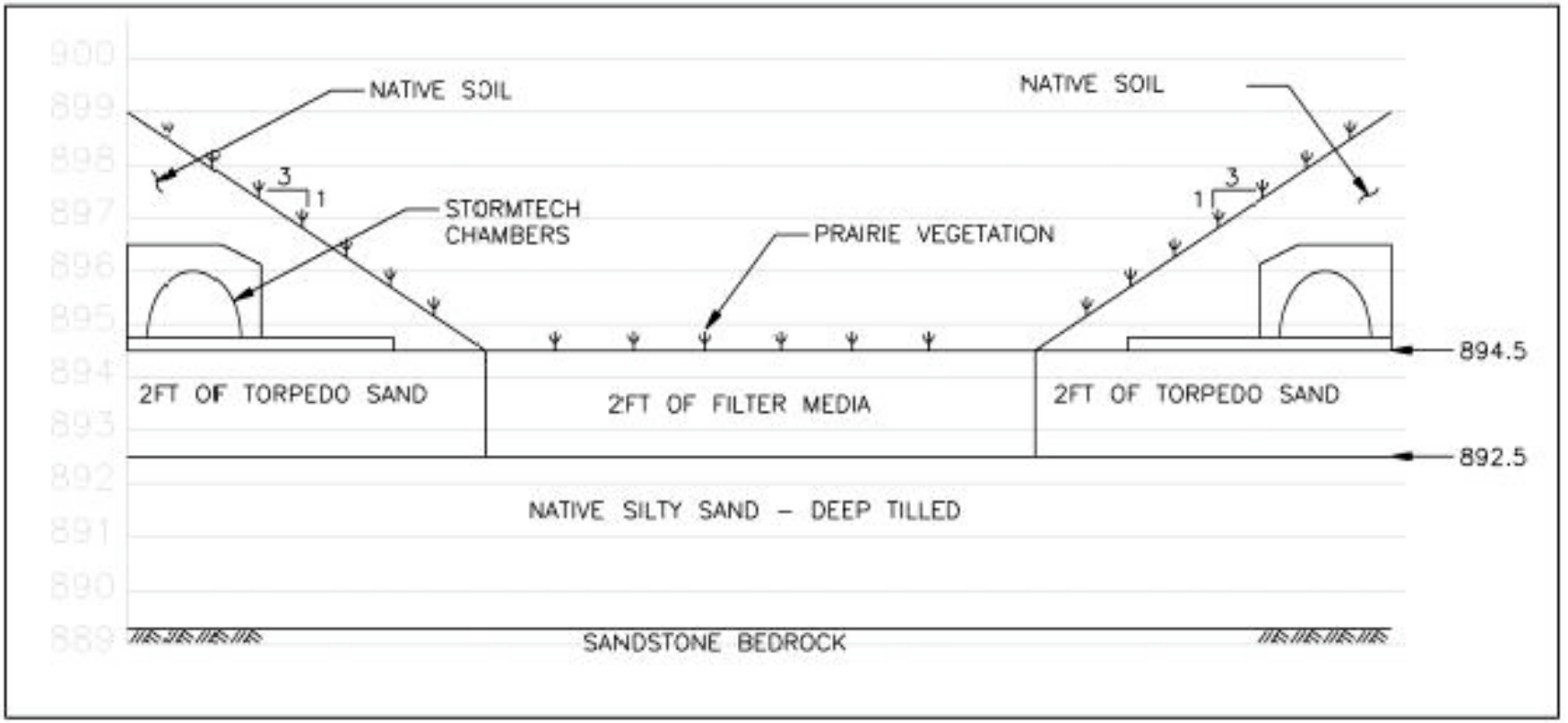
Soil Types

Clay from surface horizon

Silty Sand from sub-surface horizon

Compost, Sand, Loam Filter Mix

Infiltration Basin Cross Section – Monona, WI



INFILTRATION BASIN TYPICAL SECTION

NTS

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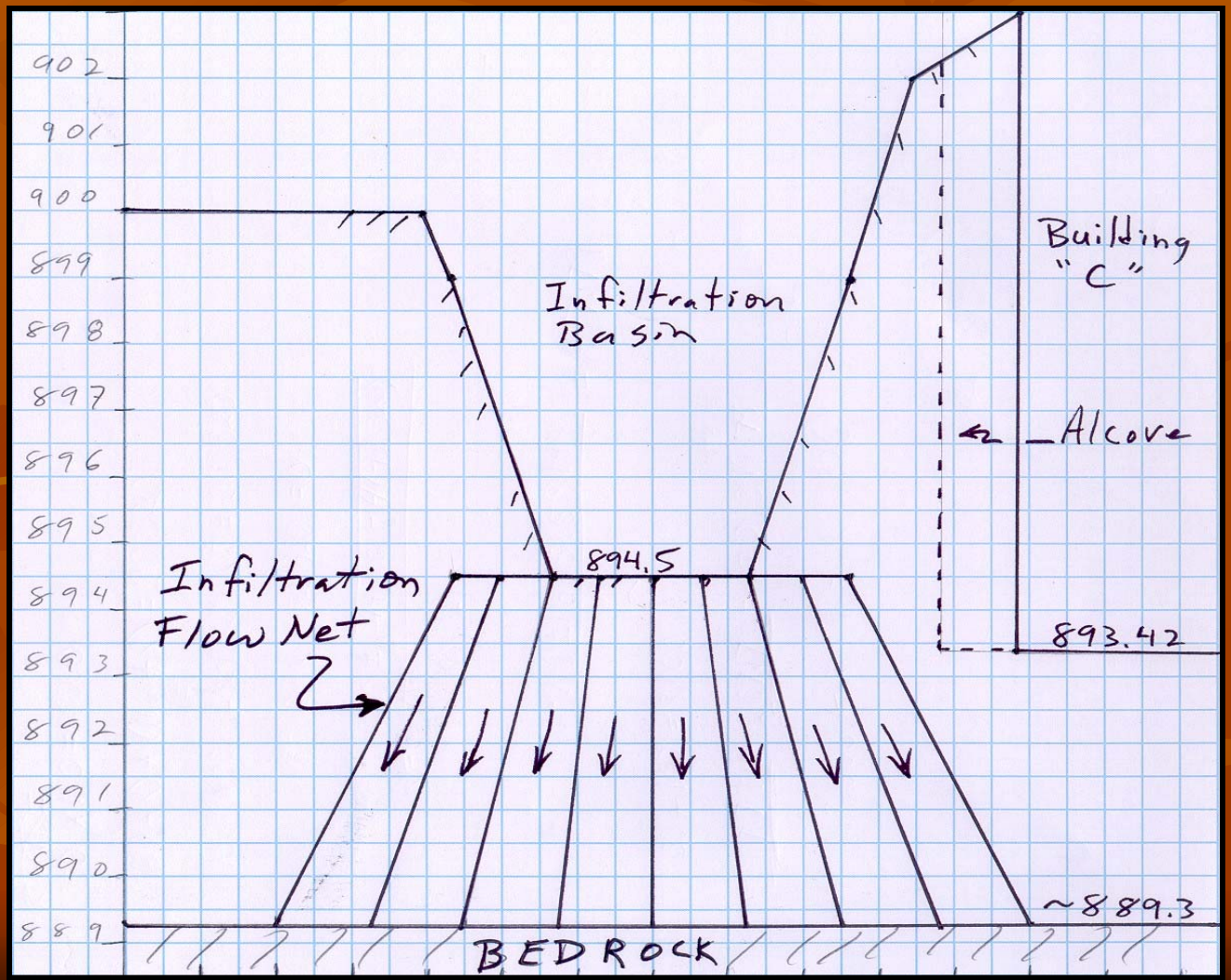
Mounding Potential – Vertical Separation Must Be to Highest Anticipated Groundwater Elevation



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Design Infiltration Rate If Not Measured

- Select the Design Infiltration Rate from Table for the Least Permeable Soil Horizon Five Feet Below the Bottom Elevation of the Infiltration Device.

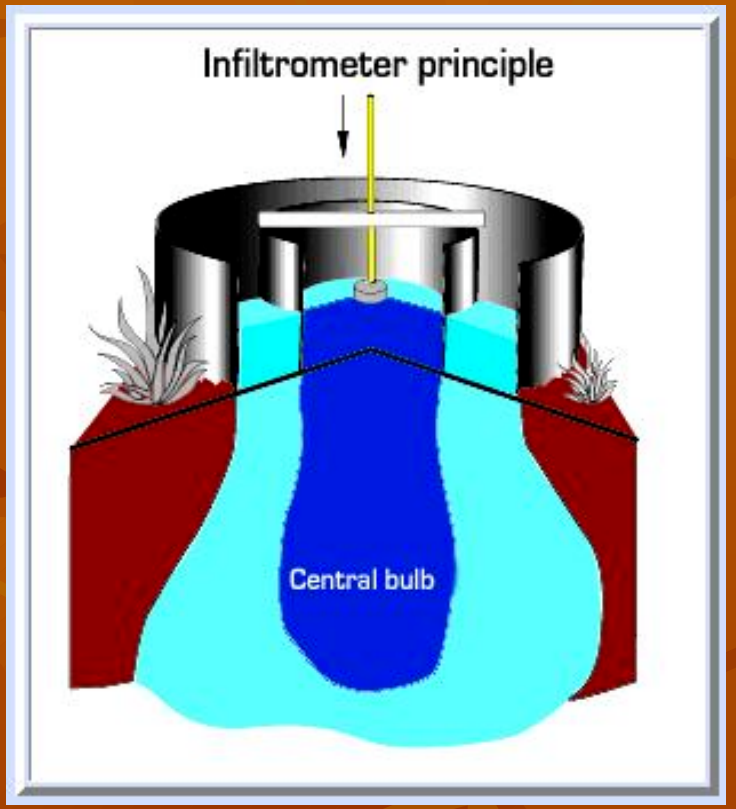
Design Infiltration Rates for Soil Textures Receiving Stormwater

Soil Texture	Design Infiltration Rates Without Measurements, inches/ hour
Sand	3.60
Loamy Sand	1.63
Sandy Loam	0.50
Loam	0.24
Silt Loam	0.13
Clay	0.07

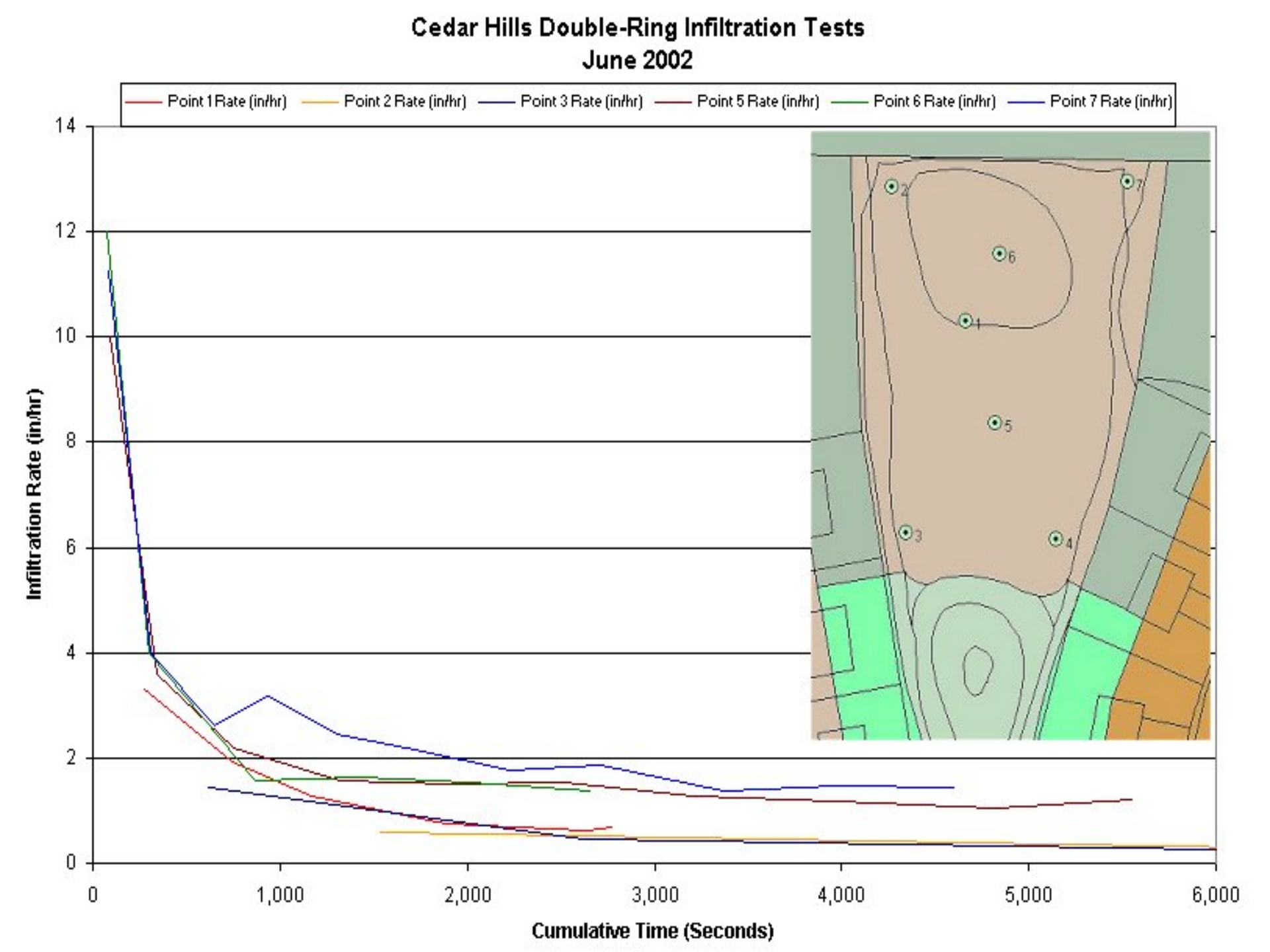
Meaured Infiltration Rate

- Test Conducted at the Bottom Elevation of the Infiltration Device.
- The Measured Infiltration Rate Shall Be Divided by a Correction Factor
  - Factor Adjust for Compaction During Construction
  - Factor Adjust for Less Permeable Soil Horizon.
  - Factor Adjust for Variability in Subsurface Soil Horizons Throughout the Site.

Double-Ring Infiltrometer – ASTM D3385



Cedar Hills Double-Ring Infiltration Tests
June 2002

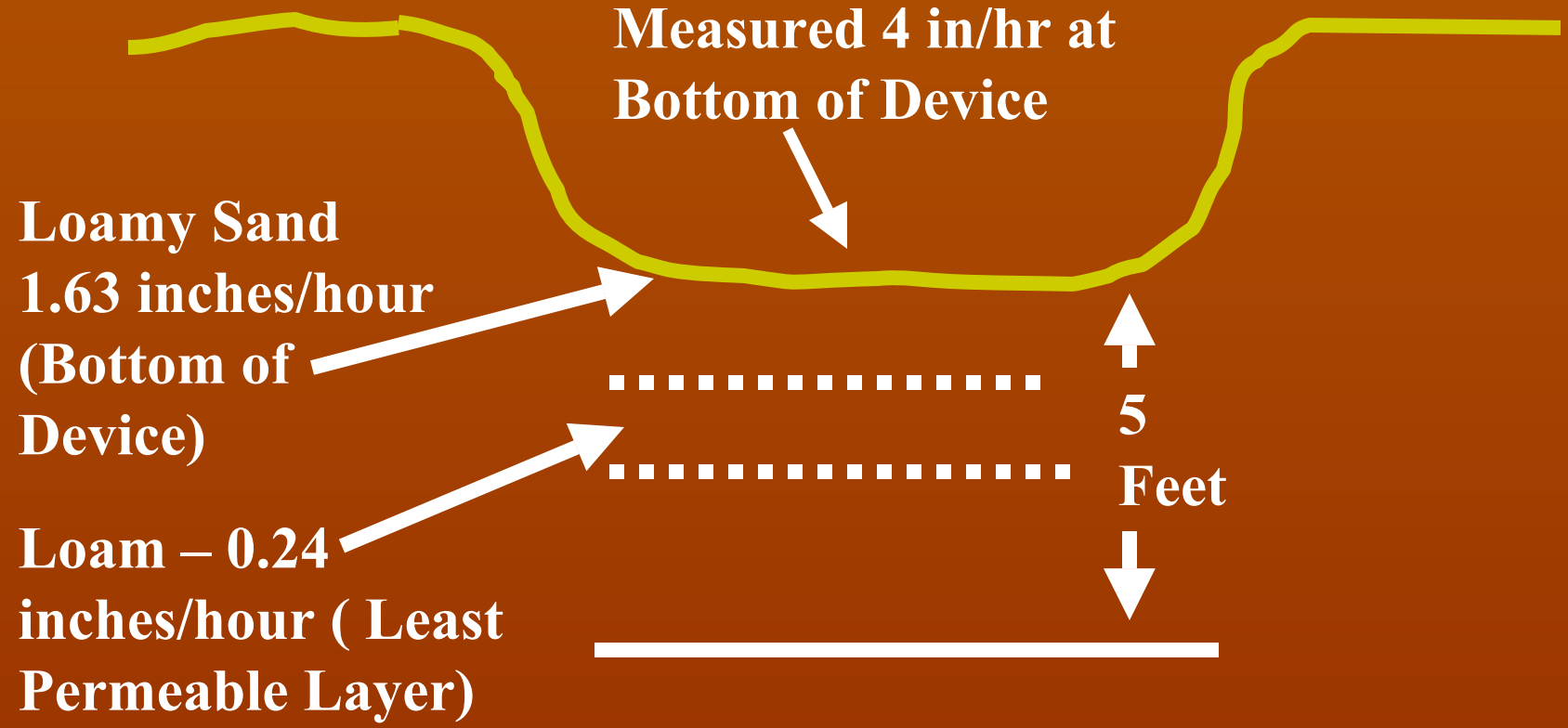


Corrected Infiltration Rate

Corrected Infiltration Rate = Measured Infiltration Rate / Correction Factor

Correction Factor Found in Table 3. Each Correction Factor Corresponds to a Range of Design Infiltration Ratios.

$$\text{Ratio} = \frac{1.63 \text{ in/hr}}{0.24 \text{ in/hr}} = 6.8$$



Total Correction Factors Divided Into Measured Infiltration Rates

Ratio of Design Infiltration Rates	Correction Factor
1	2.5
1.1 to 4.0	3.5
4.1 to 8.0	**4.5**
8.1 to 16.0	6.5
16.1 or greater	8.5

Corrected Infiltration Rate for Example

Corrected Infiltration Rate = 4 in/hr / 4.5

Corrected Infiltration Rate = 1.1 in/hr

Step D – Soil and Site Evaluation Report Contents

- The Site's Legal Description and All Information Required in Steps B and C Shall be Included in the Report.
- Reports Shall be Completed Prior to the Construction Plan Submittal

Required Qualifications:

Site Evaluations:

Licensed Professionals with Experience in Soil Investigations , Interpretation, and Classification.

Soil Evaluations:

Soil Scientist Licensed by the Department of Regulation or Professional Acceptable to Authority.


Cedar Hills
Infiltration Basin –
Cross Plains, WI

Performance of Low-Impact Design Based on Annual Precipitation

* Site is approximately 75% built-out

Water Year	Construction Phase	Rainfall (inches)	Volume Leaving Basin (inches)	Percent of Volume Retained
1999	Pre	33.3	0.46	99%
2000	Active	33.9	4.27	87%
2001	Active	38.3	3.68	90%
2002	Active*	29.4	0.96	97%

Questions?